

Pollution Prevention Fact Sheet

Chemical Production

Utah Department of Environmental Quality

Promoting a Healthy Environment

The pollution prevention practices described here have been developed specifically for the chemical production industry and have been implemented in other chemical production facilities.

What is pollution prevention?

Pollution prevention is the reduction or elimination of discharges or emissions to the environment. This includes all pollution: hazardous and non-hazardous, regulated and unregulated, across all media, and from all sources. Pollution prevention can be accomplished by reducing the generation of wastes at their source (source reduction) or by using, reusing or reclaiming wastes once they are generated (environmentally sound recycling).

Why practice pollution prevention?

Pollution prevention is good business. While most pollution control strategies cost money, pollution prevention has saved many companies thousands of dollars in treatment and disposal costs alone. Many companies have already discovered the tremendous benefits of pollution prevention. The 3M Co.'s "Pollution Prevention Pays" Program has eliminated the annual generation of more than 500,000 tons of pollutants. Cumulative savings since the program began in 1975 are estimated at \$426 million.

Smaller companies can also benefit. One firm reduced its hazardous waste disposal costs by 74% and decreased raw material costs by 16%.

By reducing or eliminating wastes a company can:

- ! Solve the waste disposal problems created by land bans.
- ! Reduce waste disposal costs.
- ! Reduce costs for energy, water and raw materials.
- ! Reduce operating costs.
- ! Protect workers, the public and the environment.
- ! Reduce risk of spills, accidents and emergencies.
- ! Reduce vulnerability to lawsuits and improve its public image.
- ! Generate income from wastes that can be sold.

Each of the pollution prevention practices described in this fact sheet is an extension of the simple but powerful idea that it makes far more sense to eliminate the generation of waste than to develop complex and costly treatment schemes once it has been generated. How do we get started?

A systematic approach will produce better results than piecemeal efforts. An essential first step is a comprehensive waste audit. The waste audit should systematically evaluate opportunities for improved operating procedures, process modifications, process redesign and recycling.

To conduct a waste audit, follow these steps:

- List all generated waste.
- Identify the composition of the waste and the source of each substance.
- Identify options to reduce the generation of these substances in the production or manufacturing process.
- Focus on wastes that are most hazardous and techniques that are most easily implemented.
- Compare the technical and economic feasibility of the options identified.
- Evaluate the results and schedule periodic reviews of the program so it can be adapted to reflect changes in regulations, technology, and economic feasibility.

Will pollution prevention work in chemical production?

A 1987 Chemical Manufacturer's Association (CMA) survey indicates that the chemical industry has made strides in waste reduction. In 1987, 77% of hazardous solid waste was recycled. The generation of solid waste, excluding material that was recycled, was reduced by about 40% between 1981 and 1987. Despite these reductions, according to Department of Commerce figures, in 1988 the chemical industry spent approximately \$3.1 billion on pollution control. So the industry still has tremendous incentive to reduce waste.

Setting up a pollution prevention program does not require exotic or expensive technologies. Some of the most effective techniques are simple and inexpensive. Others require significant capital expenditures, however many provide a return on that investment.

Improved Operating Procedures

Good operating procedures rely not on changes in technology or materials, but on human adaptability. Small changes in personnel practices, housekeeping, inventory control, waste stream segregation, material handling and scheduling improvements, spill and leak prevention and preventive maintenance can mean big waste reductions. To reduce waste in chemical production:

- Reduce inventory of raw materials. Test materials first to determine whether or not they can be used in current manufacturing processes.
- Reduce excess and off-specification production. Produce only the amount requested or needed.
- Segregate waste to recover useful materials and cut disposal costs.
- Conserve water. Reuse rinse waters. If possible, clean process equipment with process fluids.
- Prevent contamination of storm water runoff, thereby eliminating treatment of contaminated rainwater. Replace leaking valves, pumps and seals.

Process Redesign

Chemical engineers are uniquely qualified to solve problems in the chemical industry because of their background in disciplines including, chemistry, reaction kinetics, physics, thermodynamics, engineering, fluid mechanics, economics, and fine particle technology. In the past, chemical engineers have done a good job of designing and modifying chemical production processes and technologies to recover product and unconverted raw materials. They pursued this strategy to the point that the cost of further recovery could not be justified. Now the costs of end-of-pipe treatment and disposal have made source reduction an equally good investment. Greater reductions are possible when process engineers trained in pollution prevention incorporate waste reduction into process redesign projects. Designs that reduce the amount of waste generated can also reduce energy consumption and maintenance costs.

Recycling

Recycling is the use, reuse, or reclamation of a waste after it is generated. The chemical firm should check with federal, state and local environmental authorities for applicability of recycling programs. Examples of recycling opportunities include:

- Recycle and reuse excess, off-specification materials and samples taken for quality control testing.
- Reuse inert ingredients when flushing solids handling equipment.
- Segregate & reuse dust emissions in the production process.
- Distill waste solvents, and regenerate catalysts.

Process Modifications

Rethinking an entire production or manufacturing process can be a very effective way of preventing pollution. Often the new process is more efficient and costs less to operate. Upgrading the system not only reduces waste but can improve product quality, save money by reducing the need for maintenance, and increase control of raw materials used in production. Consider the following process modifications:

- Improve scheduling. Scheduling the production of chemicals that use the same production line can reduce cleaning requirements.
- Shift from batch manufacturing to continuous manufacturing. This can reduce evaporation loss.
- Maximize dedication of process equipment. This can reduce equipment cleaning frequency and waste generated.
- Relocate process equipment and change piping configuration to prevent possible contamination from other sources.
- Clean equipment with small amounts of cleaning solution. If water is the cleaning agent, use sprays or jets of water to clean tanks or equipment. Where possible, the small amount of concentrated waste collected should be recycled as a raw material.

- Rinse machinery and tanks less often.
- Use pumps and piping systems to transfer liquid materials. This can reduce spillage.
- Reformulate products. For example, prepare chemicals in pellet form instead of powder, to reduce dust emissions.
- Substitute less toxic or non-toxic materials as raw products.

This fact sheet should only be an introduction to pollution prevention since new ideas are always being developed. It cannot include every existing pollution prevention practice. Mention of a specific practice should not be considered an unqualified endorsement, and not every practice is suitable for every facility.

Who's going to do it?

Pollution prevention requires a new attitude about pollution control. Traditional thinking places all the responsibility on a few environmental experts in charge of treatment. The new focus makes pollution prevention everyone's responsibility. Preventing pollution may be a new role for production-oriented managers and workers, but their cooperation is crucial. It will be the workers themselves who must make pollution prevention succeed in the workplace.

Management commitment and employee participation are vital to a successful pollution prevention program. Management can demonstrate its commitment to pollution prevention and encourage employee participation by:

- Training employees in pollution prevention techniques
- Encouraging employee suggestions
- Providing incentives for employee participation
- Providing resources necessary to get the job done.

For more information, contact:

Department of Environmental Quality 1-801-536-4400.
 Division of Solid & Hazardous Waste 1-801-538-6170
 Pollution Prevention Coordinator 1-801-536-4477.

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